

Corresponding author.

Keywords: Brain injury; Driving; Cognitive impairments

Resume driving after a brain injury is a delicate question. Indeed, there is at present no national legislation concerning the assessment of driving skills. This study aims to create a protocol that evaluates the driving abilities of brain-injured people. We want to study, in particular, the impaired cognitive processes which can be involved in driving activity, such as attentional processes, executive functions or cognitive control.

From this viewpoint, we elaborated a complete protocol of driving assessment, which combines an evaluation on a driving simulator and on the road with neuropsychological tests. The driving simulator is coupled with an eye-tracker, which allows recording the eye movements. Some test scenarios were created to study specifically certain cognitive mechanisms, like selective attention.

The investigated population sample consisted of 9 brain-injured persons (severe traumatic brain injury, cerebral vascular accident or aneurysm rupture). They presented a score of 8 (or lower) on the Glasgow coma scale (GCS) and had been in the coma during at least 48 hours. All the participants had acquired a good driving experience before the injury and drove regularly on all road types. The brain-injured population was compared with a reference population, equivalent in terms of age and driving experience.

The results of the neuropsychological tests brought to light impaired mechanisms of the brain injured persons (selective and shared attention, processing speed, anticipation/planning, etc.). These mechanisms are known to be particularly used during driving. Some observed impairments lead indeed to difficulties in driving. For example, the patient LC, impaired in shared attention, doesn't succeed in sharing his attention between the road and vehicle management. However, impairment has no systematic impact on driving. Indeed, the patient NP is impaired in anticipation but he anticipates potentially dangerous events on the simulator, such as a child playing on the pavement. This shows that driving, as a dynamic situation, motivates the adaptations, which allow compensating for these impaired mechanisms. Thus, all cognitive impairments do not necessarily imply irreparable impact on driving.

doi:10.1016/j.rehab.2011.07.403

P116-EN

Using repetitive Transcranial Magnetic Stimulation (rTMS) for the rehabilitation of visuospatial neglect following right hemisphere strokes: Theoretical background, initial experiences and preliminary data and from the project PHRC regional "NEGLECT"

M. Toba^{a,*}, F. Rastelli^a, C. Tchokotche^b, M.C. Nierat^c, R. Migliaccio^a, S. Vincent^d, P. Pradat-Diehl^d, A. Valero-Cabré^a

^a *Plasticité et rééducation, projet PHRC régional NEGLECT, équipe de dynamiques cérébrales, CNRS UMR 7225 CRICM, DRCD, AP-HP, Paris, France*

^b *Unité de recherche clinique, hôpital Fernand-Widal-Lariboisière, Paris, France*

^c *Hôpital européen Georges-Pompidou, Paris, France*

^d *Service de rééducation et médecine physique, hôpital de la Pitié-Salpêtrière, AP-HP, Paris, France*

*Corresponding author.

Keywords: Transcranial Magnetic Stimulation; RTMS; Neglect; Stroke; Interhemispheric rivalry; Inhibition

Stroke represents the most frequent cause of severe long-term neurological disability in the adult. When occurring in regions of the right hemisphere, they frequently give rise to visuo-spatial neglect, a neurological condition considered to be a better predictor of functional dependency than the actual stroke severity [1,2]. Neglect consists in failures to detect and localize stimuli present in the real or imagined contralesional space, unawareness to stimuli applied to the patient's contralateral body parts, and an inability to make voluntary use of a fully functional (left) limb. Among many others, one physiopathological hypothesis is based on the notion of interhemispheric rivalry [3] by which unilateral brain

ciated regions but induces an hyperactivation of homologue regions in the intact or spared hemisphere. As a result, both cortical and subcortical regions within the damaged brain hemisphere become over-inhibited by the spared contralesional regions through inhibitory transcallosal projections, thus unable to operate fully adaptive reorganization processes allowing to overcome the effects of the injury. Any strategy able to reduce such degree of over inhibition from the intact side should result into a partial or complete cancellation of visuospatial neglect signs.

We discuss the use of suppressive interventions, such as low frequency rTMS, on the intact left posterior parietal regions to test the clinical viability of such a fundamental hypothesis and help patients recover from spatial neglect, which is dramatically invalidating since it abolishes the feasibility of rehabilitation techniques. We also discuss the notion that by restoring adequate representation of personal and peripersonal space, both frequently abolished in hemispatial neglect, we will trigger further recovery not only in visual and tactile spatial processing, but also in other behavioral domains such as motor function.

References

- [1] Parton A, Malhotra P, Husain M. Hemispatial neglect. *J Neurol Neurosurg Psychiatry* 2004;75:13–21.
- [2] Cherney LR, Halper AS. Unilateral visual neglect in right-hemisphere stroke: a longitudinal study. *Brain Inj* 2001;15:585–92.
- [3] Kinsbourne M. Hemi-neglect and hemisphere rivalry. *Adv Neurol* 1977;18:41–9.

doi:10.1016/j.rehab.2011.07.404

P117-EN

Repetitive Transcranial Magnetic Stimulation (rTMS) in the rehabilitation of visuo-spatial neglect in human stroke patients: Details from an ongoing multicentric double blind clinical trial

F. Rastelli^{a,*}, M. Toba^a, C. Tchokotche^b, M.C. Nierat^c, R. Migliaccio^a, S. Vincent^d, P. Pradat-Diehl^d, A. Valero-Cabré^a

^a *Plasticité et rééducation, projet PHRC régional NEGLECT, CNRS UMR 7225 CRICM, équipe de dynamiques cérébrales, DRCD, AP-HP, Paris, France*

^b *Unité de recherche clinique, hôpital Fernand-Widal-Lariboisière, Paris, France*

^c *Hôpital européen Georges-Pompidou, Paris, France*

^d *Service de rééducation et médecine physique, hôpital de la Pitié-Salpêtrière, AP-HP, Paris, France*

*Corresponding author.

Keywords: Transcranial magnetic stimulation; RTMS; Stroke; Neglect; Clinical trial; Double blind

Right hemisphere strokes commonly give rise to a visuo-spatial neglect syndrome, a neurological condition considered to be a better predictor of functional dependency than the actual stroke severity (Cherney and Halper, 2001; Parton et al. 2004). The project "PHRC Régional NEGLECT" is a state-funded ongoing multicentric double blind clinical trial in human chronic stroke patients aiming at evaluating the efficacy and safety of 10 consecutive sessions of low frequency 1 Hz rTMS in the intact left posterior parietal regions to improve neglect derived from right stroke damage. To achieve this goal a large population of patients ($n=148$) chronically affected by visuospatial deficits is being recruited in 12 different clinical institutions from the AP-HP network. Patients that fulfil inclusion criteria undergo structural MRI and tractography DTI imaging. They will be later randomized to real or sham (placebo) stimulatory conditions, in a stratified manner (i.e. according to neglect severity). Classical paper-and-pencil and computer based neglect tests, along with left parietal functions assessment and a long list of motor performance, cognitive status and mood evaluation scales have been implemented to determine the extent and intensity of participants' deficits and periodically assess their response to treatment, not only during the 10 days rTMS regime, but also for up to 6 months post-stimulation.

The hypothesis is that patients submitted to real patterns of rTMS will show higher levels of neglect recovery than those receiving sham rTMS, and that these effects will be contingent to lesion severity and neglect impairment. Furthermore,

we predict that visuospatial progress will trigger ameliorations in motor deficits following along. If this will be the case, alternative therapies based on the use of the rTMS could be used to trigger restitution effects in cognitive, sensitive and motor areas affecting stroke patients. The choices taken and the problems encountered during the preparation of such an ambitious clinical project will be shared and discussed.

References

- Cherney LR and Halper AS. Unilateral visual neglect in right-hemisphere stroke: a longitudinal study. *Brain Inj* 2001;15:585–92.
- Parton A, Malhotra P, Husain M. Hemispatial neglect. *J Neurol Neurosurg Psychiatry* 2004;75:13–21.
- doi:[10.1016/j.rehab.2011.07.405](https://doi.org/10.1016/j.rehab.2011.07.405)